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A NEW SPECIES OF *TRITELEIA* (THEMIDACEAE) FROM THE SOUTHERN SIERRA NEVADA

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Abstract

Triteleia piutensis E. Kentner & K. Steiner is described as a new species from the Piute Mountains of the southern Sierra Nevada in Kern County, California where it is known from only two small populations. Both populations are located in openings in pinyon-juniper woodland on volcanically derived soils. It is distinguished from other *Triteleia* species that have stamens attached at two different levels by its erect, yellow, campanulate flowers with recurved lobes, its short ovary stalk, and a geographic range restricted to the extreme southern Sierra Nevada Mountains. A revised key to *Triteleia* species with stamens attached alternately at two levels is provided.

Key Words: Piute Mountains, Sierra Nevada, Themidaceae, *Triteleia*.

Triteleia Douglas ex Lindl. (Themidaceae) is a genus of 15 species that is widely distributed in western North America with a center of diversity in the Klamath region of northern California and southern Oregon (Pires 2003). Until recently, *Triteleia* has been assumed to be closely related to *Brodiaea* Smith and *Dichelostemma* Kunth based on the presence of an extended perianth tube (Keator 1989). However, despite the extended tube and similarities with those genera in other morphological characters (e.g., corm, leaf, anthers, stamen appendages, scape pubescence, seeds, and chromosome number [Hoover 1955]), analyses of plastid DNA sequences by Pires and Sytsma (2002) suggest that *Triteleia* is more closely related to *Bloomeria* Kellogg than to either *Brodiaea* or *Dichelostemma*. These analyses have also indicated that these genera are best placed in the Themidaceae, rather than in the Amaryllidaceae or Liliaceae (Pires and Sytsma 2002).

The most important diagnostic characters within *Triteleia* are features of the androecium and gynoecium. The insertion of the stamens relative to the perianth, the lengths of the filaments, and the presence or absence of apical filament appendages are major features used in distinguishing among the species, as are the relative lengths of the gynophore (ovary stalk) and ovary. Other useful taxonomic characters include the overall size and shape of the perianth, the relative length of the perianth tube and lobes, and the length of the pedicels (Hoover 1941; Pires 2003; Pires and Keator 2012). However, in several *Triteleia* species, these characters can be highly variable, and in at least one species, *T. grandiflora* Lindley, diploid and tetraploid individuals have been shown to differ in floral morphology (Barkworth 1977). Chromosomal changes, including polyploidy and aneuploidy, are common in *Triteleia* and seem to be the primary mode of evolution within the genus (Burbanck 1941; Lenz 1975, 1976).

While most *Triteleia* species occur in northern California and the Pacific Northwest, three species – *T. hyacinthina* (Lindl.) Greene, *T. laxa* Benth., and *T. dudleyi* Hoover – extend into southern California in the San Gabriel Mountains and foothills of the San Bernardino Mountains (Consortium of California Herbaria 2013). Two species, *T. grandiflora* and *T. hyacinthina*, range east into Montana and Wyoming, and *T. lemmoniae* (S. Watson) Greene is found only in central Arizona (Pires and Sytsma 2002). Two island endemics are known, *T. guadalupensis* L. W. Lenz from Guadalupe Island off the coast of Baja California, and *T. clementina* Hoover, on San Clemente Island off the southern California coast. Hoover (1941) noted that *Triteleia* is represented in the northern part of its range primarily by species of wide distribution, while in the south the species have localized distributions and are widely separated geographically. On the mainland, *Triteleia* is uncommon south of the Tehachapi Mountains (Hoover 1955) and its southern limit is demarcated by a handful of sites in the San Gabriel and San Bernardino Mountains (Consortium of California Herbaria 2013).

During a botanical survey in the Piute Mountains of the southern Sierra Nevada in 2010 a *Triteleia* population was discovered that could

FIG. 1. Photograph of *Triteleia piutensis* (short-statured form pictured from the population north of Emerald Mountain, Kern County, California). Note the erect, yellow, campanulate flowers with recurved perianth lobes. Photograph courtesy of Jason Brooks.

not be referred to any known species using Keator (1993), Pires (2003), or Munz (1974). Photographs and descriptions of the plants were sent to several experts on the genus (Chris Pires, Glenn Keator, and Lee Lenz) with the consensus that it could be an undescribed species. In February 2013, we learned that another population of this species had been collected by Eve Laeger in 2001 about nine kilometers (km) south of the population that was discovered in 2010. This new species is described herein, and a revised key to the *Triteleia* species with unequally inserted stamens is provided.

TAXONOMIC TREATMENT

Triteleia piutensis E. Kentner and K. Steiner, **sp. nov.** (Figs. 1, 2).—TYPE: USA, California, Kern Co., Southern Sierra Nevada Mountains, approximately 3.2 km by air north of Emerald Mountain on ridgeline between Back Canyon and Indian Creek, UTM NAD 83 Zone 11 384113E, 3905222N / 35°17′0.4″N, 118°16′27.6″W (WGS 84), 1655 m, 3 June 2010, *O. Singh 1149* (holotype: UCR).

Corm with coarse fibrous coat, 0.7–1.5 dm below ground level; Leaves 1–2, 2–8 mm wide, 15–44 cm long; scape smooth to slightly scabrous at base, 1.2–14 cm; bracts purplish; pedicels 2–25 mm; perianth 11–21 mm, yellow with a central abaxial ±green to brown/purple stripe that broadens distally, tube 5.5–10 mm, tapered at base, lobes 6–13 mm, ascending and recurved, not spreading; stamens inserted alternately at two levels with the upper level 1–2 mm above the lower level, unequal in length, short filaments 1.7–4.5 mm and long filaments 3–5 mm, linear to slightly thickened at base, anthers 1.8–2.5 mm, lacking appendages, pollen white; ovary 2–6 × stalk, green, longer than the stalk in fruit.

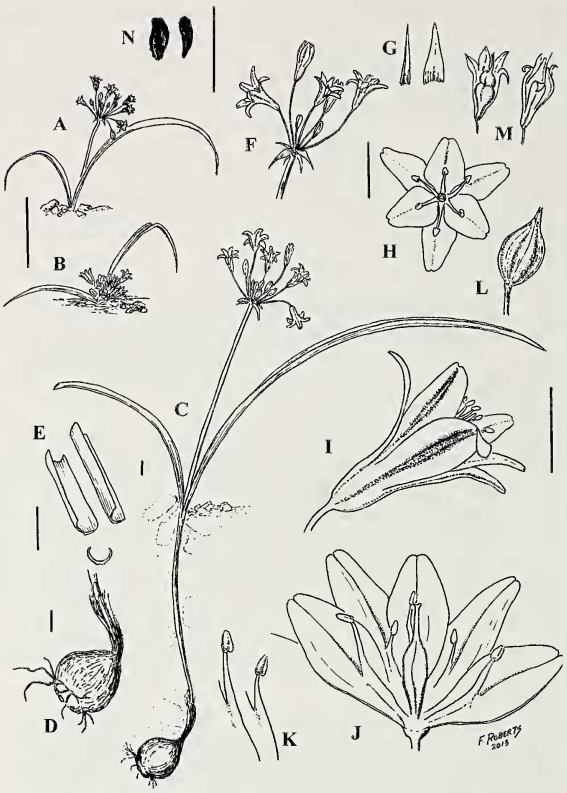

FIG. 2. Line drawings (by Fred Roberts) of *Triteleia piutensis*. A. Tall-statured form; B. Short-statured form; C. Whole plant; D. Corm; E. Leaf shape and cross section; F. Inflorescence detail; G. Inflorescence bracts; H. Flower top view; I. Flower side view; J. Flower internal detail; K. Stamen attachment detail; L. Developing fruit enclosed in tepals; M. Mature fruits shown with and without enclosing tepals; N. Mature seed. All scale bars equal 1 cm except for A and B (1 dm), and N (2 mm).

Paratype: USA, California, Kern Co., Southern Sierra Nevada Mountains, approximately 15.3 km by air northeast of Tehachapi on the ridge west of Horse Canyon about 100 m east of a prominent area of white volcanic soils, UTM NAD 83 Zone 11 381169E, 3896484N / 35°12′15.6″N, 118°18′19.6″W (WGS 84). 1585 m, 16 May 2001, *E. Laeger 3965* (UCR). Figs. 1, 2.

Etymology

The specific epithet is named for the Piute Mountain range in the extreme southern Sierra Nevada, where the plants were discovered. These Mountains were unglaciated during the Ice Ages (Hill 2000), and are known to support many rare and uncommon vascular plants. Taxa endemic to the range include *Hesperocyparis nevadensis* (Abrams) Bartel, *Eriogonum kennedyi* Porter ex S. Watson var. *pinicola* Reveal, *Streptanthus cordatus* Nutt. var. *piutensis* J. T. Howell, and possibly the new *Triteleia* species described here,

although the extent of its distribution remains unknown.

Distinguishing Characteristics

In live plants, the most obvious characteristic distinguishing *T. piutensis* from its congeners are its erect, bright yellow, campanulate flowers, with ascending recurved perianth lobes that do not spread at anthesis and enclose the capsule in fruit. The pedicels are ascending and the flowers and fruit are held erect. Among the yellow-flowered *Triteleia* species known to occur in the vicinity of the southern Sierra Nevada, it is easily distinguished from *T. ixioides* (W.T. Aiton) Greene and *T. dudleyi*, which differ in having stamens inserted on the perianth at a single level and filaments with distinctive shapes and/or tip appendages (Pires and Keator 2012).

Taxonomic Relationships

Triteleia piutensis is morphologically most similar to *T. crocea* (Alph. Wood) Greene, a species assumed to be restricted to the Klamath and High Cascade Ranges of northern California and southwest Oregon (Pires 2003), but with the interesting exception of a single 1954 collection from Kern County (*Hoover 8337* [RSA, SD, UC]) discussed below. Both species have stamens attached alternately at two levels and linear filaments of alternate lengths. The filament lengths are similar in the two species, but the anthers are slightly larger in *T. piutensis* (1.8–2.5 mm vs. 1.5–2 mm in *T. crocea* [Hoover 1941; Pires and Keator 2012]). The species differ in the relative length of the ovary stalk, which is about equal to, or slightly longer than the ovary in *T. crocea* (Hoover 1941) and distinctively short in *T. piutensis,* with the ovary 2–6× longer than the stalk. The campanulate perianth of *T. piutensis* is distinctive and contrasts with the widely spreading perianth lobes of *T. crocea*. The two species also differ in scape height (0.12–1.4 dm in *T. piutensis* vs. 1–3 dm in *T. crocea*), although this character may be influenced by growing conditions in *T. piutensis*, as discussed below.

Hoover's collection of *T. crocea* from Kern County remains somewhat of a mystery as it represents a range extension of more than 650 km. The site of his collection is located about 45 km north of the *Triteleia* populations described here, and it was initially suspected that Hoover's collection could represent another population of *T. piutensis*. However, duplicates of Hoover's collection (SD71153, RSA201599) have ovary stalks equal in length to the ovaries, and do not closely resemble *T. piutensis* in perianth shape or habit. Hoover (1955) noted that his Kern County collection of *T. crocea* had smaller anthers than specimens from northern California and Oregon, but could find no other characters distinguishing the southern plants. While the possible existence of *T. crocea* in Kern County warrants further study, the available material appears to be distinct from *T. piutensis.*

Phenology

Triteleia piutensis flowers from May to June and fruits in June to July.

Habitat, Ecology, and Conservation Implications

Triteleia piutensis is currently known from two populations in the extreme Southern Sierra Nevada Mountains separated by about nine km in distance and ca. 70 m in elevation. The southern population, discovered by Eve Laeger in 2001, occurs on the ridge west of Horse Canyon, 15.3 km northeast of Tehachapi in fine volcanic soils among scattered boulders. The vegetation consists of open woodland dominated by *Juniperus californica* Carrière with occasional *Pinus monophylla* Torr. & Frém. Other associated species include *Ericameria linearifolia* (DC) Urbatsch & Wussow, *Ericameria teretifolia* (Durand & Hilg.) Jeps., *Hesperoyucca whipplei* (Torr.) Trel., *Lewisia rediviva* Pursh, *Allium cratericola* Eastw., *Poa secunda* J. Presl, and *Bromus tectorum* L. This population occurs on private land about 100 m west of a parcel under the jurisdiction of the Bureau of Land Management (BLM). Several hundred plants were observed in two patches on 16 May 2001, but only about a 30 plants could be found when the site was revisited on 27 April 2013, a year in which conditions were quite dry.

The northern population, discovered by Jason Brooks in 2010, is located 3.2 km north of Emerald Mountain on an approximately 0.15 acre flat ridge top opening in a woodland dominated by *P. monophylla* and *Quercus john-tuckeri* Nixon & C. H. Mull. The exposed heavy clay soils of the opening are underlain with a hardpan derived from volcanic rocks. Associated species include *Poa secunda*, *Perideridia pringlei* (J. M. Coult. & Rose) A. Nelson & J. F. Macbr., *Calochortus kennedyi* Porter, and sparse annuals like *Microsteris gracilis* (Hook.) Greene, *Rigiopappus leptocladus* A. Gray, and *B. tectorum*. In contrast to the plants of the southern population which have scapes that average about 12 cm in length (Fig. 2A), all of the individuals in the northern population have inflorescences born nearly at ground level on short scapes averaging about 2 cm in length (Fig. 2B), perhaps due to the clay soils and hardpan at the site. This short-statured population occurs on land managed by the BLM within a few meters of the boundary fence and the adjacent private property. In two successive years (3 June 2010 and 23 June 2011), about 75 and 120 individuals were observed, respectively.

Despite intensive botanical surveys in 2010, 2011, and 2012 of several thousand acres adjacent to the northern population, no new occurrences of *T. piutensis* were found. Although there are public lands to the north of the population in the Sequoia National Forest and a checkerboard of BLM lands nearby, much of the area surrounding the site is remote and privately owned and has been poorly explored botanically. The flowers of *T. piutensis* are quite showy and distinctive, yet the species does not appear to have been previously collected despite intensive exploration of the southern Sierra Nevada by notable plant collectors and botanists such as Ernest Twisselmann and James Shevock. We conclude that *T. piutensis* is a rare narrow endemic restricted to the Piute Mountains in the southern Sierra Nevada. Nevertheless, additional populations may remain to be discovered. Both of the known populations of this species occur in the vicinity of the Tehachapi wind resource area where several large wind energy developments have recently been constructed. If additional populations exist, *T. piutensis* is likely to face increasing threats from development unless developers, consultants, and land managers are made aware of its existence, and surveys to determine its presence are conducted during the environmental review for proposed projects in the area.

Key To *Triteleia* Species With Stamens Attached Alternately At Two Levels

A revised key, after Hoover (1941) and Pires and Keator (2012), for the *Triteleia* species with stamens inserted at two levels is provided below.

1. Ovary > stalk; perianth tube rounded or short-tapered at base
   2. Perianth 17–35 mm, white to blue-purple; filaments triangular; CaR, KR . . . . . *Triteleia grandiflora*
   2′. Perianth 11–21 mm, yellow; filaments linear; s SNF . . . . . *Triteleia piutensis*
1′ Ovary <= stalk; perianth tube acute to long-tapered at base
   3. Stamens unequal in size
      4. Pedicel 7–20 mm; perianth 12–19 mm, bright yellow or pale blue; ovary green . . . . . *Triteleia crocea*
      4′ Pedicel 20–180 mm; perianth 15–28 mm, white, often flushed violet abaxially; ovary bright yellow . . . . . *Triteleia peduncularis*
   3′ Stamens ± equal in size
      5. Perianth 16–27 mm, lavender; anthers ±1.5 mm, purple; s ChI (San Clemente Island) . . . . . *Triteleia clementina*
      5′ Perianth 18–47 mm, blue, blue-purple, or white; anthers 2–5 mm, white to ± blue; NW, CaR, SN, CW, TR . . . . . *Triteleia laxa*

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Literature Cited

Barkworth, M. E. 1977. Intraspecific variation in *Brodiaea douglasii* Watson (Liliaceae). Northwest Science 51:79–90.

Burbanck, M. P. 1944. Cytological and Taxonomic Studies in the genus *Brodiaea*. II. Botanical Gazette 105:339–345.

Consortium of California Herbaria (CCH). 2013. Data provided by the participants of the Consortium of California Herbaria. Website http://ucjeps.berkeley.edu/consortium/ [accessed 5 February 2013].

Hill, M. 2000. Geologic story. Pp. 37–69 *in* G. S. Smith (ed.), Sierra East: edge of the great basin. University of California Press, Berkeley, CA.

Hoover, R. F. 1941. A systematic study of *Triteleia*. American Midland Naturalist 25:73–100.

———. 1955. Further observations on *Brodiaea* and some related genera. Plant Life 11:13–22.

Keator, G. 1989. The brodiaeas. Four Seasons 8:4–11.

———. 1993. *Triteleia*. Pp. 1206–1208 *in* J. C. Hickman (ed.), The Jepson manual: higher plants of California. University of California Press, Berkeley, CA.

Lenz, L. W. 1975. A biosystematic study of *Triteleia* (Liliaceae): 1. Revision of the species of section *Calliprora*. Aliso 8221–258.

———. 1976. A biosystematic study of *Triteleia* (Liliaceae): 2. Chromosome numbers and karyotypes of the species of section *Calliprora*. Aliso8353–377.

Munz, P. 1974. A flora of southern California. University of California Press, Berkeley, CA.

Pires, J. C. 2003. Triteleia. Pp. 321–339 *in* Flora of North America Editorial Committee (eds.). Flora of North America North of México, Vol. 26: Magnoliophyta: Liliidae: Liliales and Orchidales. Oxford University Press, New York, NY.

——— and K. J. Sytsma. 2002. A phylogenetic evaluation of a biosystematic framework: *Brodiaea* and related petaloid monocots (Themidaceae). American Journal of Botany 89:1342–1359.

——— and G. Keator. 2012. Triteleia. Pp. 1512–1514 *in* B. G. Baldwin, D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds.),The Jepson manual: vascular plants of California, 2nd ed. University of California Press, Berkeley, CA.